

# THE PARTICLE SIZE DILEMMA

## Sizing flow-through separators for effective runoff treatment

Proprietary best management practices (BMPs) are often classified as emerging technologies, but flow-through separators have been used to treat urban runoff for more than a decade. Despite our experience, as an industry we still struggle to properly size and site these devices. Many factors complicate efforts to “get it right,” but perhaps more so than anything else, target particle size is largely to blame.

When flow-through separators first emerged, most storm water standards provided little guidance in regard to how they should be utilized. BMPs in the public domain are typically sized to capture and treat a specific volume of runoff. However, flow-through systems present a new challenge because they are designed for a treatment flow or operating rate as opposed to a treatment volume.

Lacking guidance, many manufacturers developed sizing methods that relied on laboratory testing with a known gradation of sediment across a range of system operating rates. One limitation with this approach is that the performance predictions remain valid only if the settling characteristics of the particles used for laboratory testing are consistent with those of particles encountered in the field.

Particle size assumptions often break down in the field, where particle size distribution is a function of rainfall intensity, site use and countless other variables. A logical solution would be to specify a conservative gradation of fine particles for laboratory analysis to ensure flow-through separators achieve an adequate level of performance. A handful of regulatory agencies have taken note of this issue and implemented specific particle size gradations for laboratory testing, but the majority have not.

More commonly, flow-through separators are sized based on documented removal of sand-sized and larger particles and then assumed to capture 80 percent of the total suspended solids (TSS) load. There is a growing body of research which documents that storm water solids measured as TSS often include significant silt and clay fractions. That said, it is no surprise that flow-through separators designed to capture rapidly settling sand-sized particles frequently fail to achieve 80 percent TSS removal in the field.

Sediment gradations used to test and predict the performance of flow-through separators are typically not conservative enough. Systems designed to remove sand-sized and larger particles have short residence times, making them smaller per unit of drainage area treated and, as a result, more economically attractive. However, without sufficient residence time to capture finer particles, water quality suffers.

To ensure flow-through separators are providing the maximum water quality benefit, they should be sized to capture and retain finer particles such as silt (less than 63 microns). To encourage the effective use of flow-through separators, a regulatory framework that mandates consistent sizing criteria including a conservative target particle size is critical. Also keep in mind that even when sized conservatively, flow-through systems are not effective for the removal of fine silt and clay or dissolved pollutants, so more effective treatment practices should be considered to address these pollutants. [SWS](#)

For more information related to this article, visit [www.estormwater.com/lm.cfm/st050801](http://www.estormwater.com/lm.cfm/st050801). For more information, write in 5001 on this issue's Reader Service Card.



Derek M. Berg

“

PARTICLE SIZE

ASSUMPTIONS

OFTEN BREAK

DOWN IN

THE FIELD ...

”

Derek M. Berg is regional regulatory manager for CONTECH Stormwater Solutions. Berg can be reached by e-mail at [bergdm@contech-cpi.com](mailto:bergdm@contech-cpi.com).